flowering season promoted greater seed set in *R. milloides* than in the more dispersed *R. baurii* var. *platypetala*. Neither selfing nor apomixis appear to be operating in these species, even though little pollinator activity was observed. Thus, viable seed production across these species' boundaries followed by vegetative reproduction enable the persistence of hybrids, which over time could become species.

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Smoke-derived compounds with germination activity: Towards understanding the mode of action by investigating structure-activity relationships of synthetic analogues

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Burning vegetation produces smoke that contains highly active compounds known to promote seed germination in many species. A butenolide compound, 3-methyl-2*H*-furo[2,3-*c*]pyran-2-one (karrikinolide; KAR_1), is one such compound that can promote germination at concentrations as low as 10^{-10} M. Conversely, a structurally-related butenolide, 3,4,5-trimethylfuran-2(5*H*)-one (trimethylbutenolide; TMB), also present in smoke, has been shown to inhibit germination and reduce the promotory effect of KAR_1 in a test system using lettuce seeds (achenes of *Lactuca sativa* L. cv. 'Grand Rapids'). Little is known, however, regarding the mechanism by which TMB inhibits germination or interacts with KAR_1. Thus, several synthetic derivatives of TMB were prepared to investigate the effect of related compounds on the germination of Grand Rapids lettuce seeds. A range of concentrations (from 10^{-3} M to 10^{-6} M) of these analogues of TMB were tested in combination with 10^{-8} M KAR_1 to determine the relative activity of the synthesised compounds. Of the 11 analogues tested, only two compounds were found to reduce the promotory effect of 10^{-8} M KAR_1 in a similar manner as observed with TMB, with activity from 10^{-3} M to 10^{-5} M. Four of the compounds were also found to have inhibitory activity at 10^{-3} M and 10^{-4} M. Since some of the synthetic compounds have exhibited inhibitory activity similar to TMB, this may be useful for the design of novel compounds with better activity.

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Seed germination of the highly utilized medicinal plant - *Coleonema album*

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Coleonema album is a South African green treasure endemic to the Cape region. Immunat, a tincture prepared from this plant is marketed commercially. Medicinal plant gatherers are on the lookout for this plant due to its high demand and market price. It is ranked among the highly utilized medicinal plants at present. Several natural product companies in South Africa are now exporting *Coleonema album* oil. Its showy beautiful white flowers make it a valuable ornamental plant. There is no accredited germination protocol available for this medicinal and ornamental plant. In this study, the chemical and environmental conditions required for optimum seed germination were studied. The results of this study have shown that low temperatures (10 and 15 °C), continuous darkness and temperature shifts (high to low) favor seed germination. High temperatures: 20, 25, 30 and 35 °C completely inhibit seed germination. A pH 6 buffer, (ammonium nitrate and sodium chloride solutions of 10^{-2} M) significantly improved seed germination at 15 °C under continuous dark conditions. The result of this study reflects a link between *Coleonema album* seed germination requirements and its geographical distribution. *Coleonema album* seeds exhibit physiological dormancy. The results of this study will be useful as a guide for mass cultivation of this aromatic and medicinal plant. It will also provide an opportunity for propagation of *Coleonema album* in other parts of the country.

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Desiccation stress and the *Xerophyta* metabolome

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Resurrection plants are unique in the ability to survive near complete water loss in vegetative tissues without loss of viability. In order to do so, they employ multifaceted strategies which include structural adaptations, antioxidant and photoprotective mechanisms, and the accumulation of proteins and metabolites that stabilise macromolecules. A full understanding of the phenomenon of vegetative desiccation tolerance will require a systems view of these adaptations at the levels of the genome, the control of gene expression, and the control of metabolic pathways. In this presentation, we report a high-throughput metabolomic analysis of the changes that occur in vegetative tissues of the resurrection plant *Xerophyta humilis* during dehydration We have used a combination of chromatography, mass spectrometry and nuclear magnetic resonance, to discern numerous primary and secondary metabolites. Multivariate statistics have revealed a subset of metabolites that are significantly up- or down-regulated in response to water deficit stress. Mapping the identified metabolites onto known biochemical pathways lets us suggest possible regulatory schemes in the stress response, inviting deeper investigation in future.

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Determination of changes in membrane lipid composition during rehydration and dehydration of the resurrection plant *Xerophyta humilis* using multiple reaction monitoring mass spectrometry

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Plants whose fully differentiated tissues are able to withstand desiccation to air-dryness for prolonged periods of time and able to resume their full metabolic functioning in existing tissues upon rewatering are termed resurrection plants. Considerable research has been conducted on the structural, physiological, biochemical and molecular changes accompanying dehydration and recovery of a number of resurrection plants in order to ascertain the protective